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CLAIMS

1. A device for automatically controlling the open-close of a slide door for a vehicle is adapted to movably open and close the slide door by driving a motor, the slide door supported so as to be able to open and close along a guide track installed in a vehicle body, the device comprising:

a door drive means having a reversible motor,

a motor load detection means for detecting a motor load of the door drive means,

a door position detection means for detecting a position of the slide door guided by the guide track within a range from a full-open to a full-close positions of the slide door,

a door speed detection means for measuring a movement speed of the slide door,

a memory means for memorizing the motor load when the vehicle stands at its normal posture as a particular motor load concerning the position of the slide door with relation to the motor load detection means and the door position detection means,

and a motor control means for controlling a power to be supplied to the motor with detecting a motor speed by a deviation between a motor load memorized correspondingly to a predetermined position of the slide door and a motor load for moving the slide door at the present position.

2. A device for automatically controlling the open-close of a slide door for a vehicle is adapted to movably open and close the slide door by driving a motor, the slide door supported so as to be able to open and close along a guide track installed in a vehicle body, the device comprising:

a door drive means having a reversible motor,

an electro-magnetic clutch for intermittently connecting the motor to the slide door so as to transfer the driving force of the motor to the slide door,

a door speed detection means for measuring the movement speed of the slide door,

and an electric door drive start means for making the electro-magnetic clutch to connect the motor to the slide door and for driving the motor, when the movement speed detected by the door speed detection

means is within an predetermined range of a movement speed previously set while stopping the motor.

3. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 2 above includes that the electric door drive start means, when recognizing the movement speed is out of the predetermined range of the movement speed previously set after passing a predetermined time length from the instant at which the electric door drive start means recognizes that the movement speed is within the predetermined range, makes the electro-magnetic clutch not to connect the motor to the slide door and makes the motor not to drive.

4. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 2 or 3 above includes that the electric door drive start means makes the motor to previously drive before making the electro-magnetic clutch to connect the motor to the slide door.

5. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 2, 3 or 4 above includes a door position detection means for detecting a position of the slide door guided by the guide track within a range from a full-open to a full-close positions of the slide door,

wherein the electric door drive start means controls a power to be supplied to the motor so that the slide door is at the position detected by the door position detection means and so as to make the door speed at a speed particular to the movement direction.

6. A device for automatically controlling the open-close of a slide door for a vehicle is adapted to movably open and close the slide door by driving a motor, the slide door supported so as to be able to open and close along a guide track installed in a vehicle body, the device comprising:

a door drive means having a reversible motor,

a door position detection means for detecting a position of

the slide door guided by the guide track within a range from a full-open to a full-close positions of the slide door,

a door existence area dividing means for dividing the range from a full-open position to a full-close position on the basis of the position data detected by the door position detection means, into the plurality of the predetermined door existence areas,

a door change element detection means for detecting a door change element by changing the sampling resolutions of the data detection position every the door existence area,

and a motor control means for controlling the motor by differently setting the control standards of the door change elements every the door existence area.

7. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 6 above includes that the door existence area has a plurality of areas in which the slide door exists during its movement along its open direction and a plurality of areas in which the slide door exists during its movement along its close direction.

8. The device for automatically controlling the open-close of the slide door for the vehicle according to the claims 6 or 7 above includes that the door change element is the movement speed of the slide door.

9. The device for automatically controlling the open-close of the slide door for the vehicle according to the claims 6 or 7 above includes that the door change element is a predetermined electric value concerning a motor load for moving the slide door.

10. The device for automatically controlling the open-close of the slide door for the vehicle according to the claims 6 or 7 above includes that the door change element is a change rate of a predetermined electric value concerning a motor load for moving the slide motor.

11. The device for automatically controlling the open-close of the slide door for the vehicle according to the claims 6, 7, 8, 9 or 10

above includes that the door change element detected by the door change element detection means is adapted not to reflect on the motor control means when the slide door exists in the area of the shut-down control region just before the slide door closes.

12. A device for automatically controlling the open-close of a slide door for a vehicle is adapted to movably open and close the slide door by driving a motor, the slide door supported so as to be able to open and close along a guide track installed in a vehicle body, the device comprising:

a door drive means having a reversible motor,

a motor load detection means for detecting a motor load of the door drive means on the basis of a drive current or a drive voltage of the motor, or the electric values of the drive current and the drive voltage,

a memory means for memorizing the electric value of the motor load to open or close the slide door when the vehicle stands at a level posture,

and a slope judgement means for calculating a deviation of the motor load by comparing the electric value of the motor load at a level posture, which value is memorized in the memory means, with another electric value of the motor load detected in ordinarily opening or closing the slide door and for discriminating the posture of the vehicle in opening or closing the slide door on the basis of the calculated deviation between both electric values concerning the motor load.

13. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 12 above includes that the memory means memorizes a motor load current and a motor drive voltage in opening the slide door, as a motor load electric value.

14. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 12 above includes that the memory means memorizes renewably a motor load electric value obtained at the period when the slide door is continuously operating from its full-close condition to its open condition along a straight

portion of the guide track at a constant movement speed.

15. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 12 above includes that the slope judgement means judges the steep upward slope when the drive voltage in the deviation between both electric values concerning the motor load is very low during a door's open operation, judging the upward slope when the drive voltage is low during the door's open operation, judging the level ground when the drive voltage is not low and the current value is not large during the door's open operation, judging the downward slope when the current value is large during the door's open operation, judging the steep downward slope when the current value is very large during the door's open operation.

16. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 12, 13 or 14 above includes that the electric value concerning the motor load is obtained by converting a drive voltage of the motor controlling a load power by a duty cycle into a voltage corresponding to the duty cycle 100%.

17. A device for automatically controlling the open-close of a slide door for a vehicle is adapted to movably open and close the slide door by driving a motor, the slide door supported so as to be able to open and close along a guide track installed in a vehicle body, the device comprising:

a door drive means having a reversible motor,

a door speed detection means for intermittently detecting the movement speed of the slide door with a predetermined time interval,

an over speed detection means for detecting an over speed adaptability difference by detecting continuously at least plural times the over speed values higher than the upper limit value which is allowable with reference to the target speed of the slide door,

a less speed detection means for detecting an less speed adaptability difference by detecting continuously at least plural times the less speed values lower than the lower limit value which is

allowable with reference to the target speed of the slide door,

an adjustment volume control means for suitably adjusting an adjustment volume for correcting the target speed on the basis of the over speed adaptability difference or the less speed adaptability difference in accordance with the target speed,

an adjustment volume re-adjusting means for reflecting the adjustment volume according to the over speed adaptability difference or the less speed adaptability difference, at least one time, on the motor control, as well as for suitably re-adjusting the adjustment volume of the over speed or the less speed according to the movement situation of the slide door,

a motor control means for controlling the drive force of the motor in accordance with the adjustment volume adjusted by the adjustment volume control means or the adjustment volume re-adjusting means.

18. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 17 above includes that the adjustment volume control means changes a magnification of the adaptability difference in accordance with the target speed.

19. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 17 above includes that the adjustment volume control means changes a magnification of the adaptability difference in accordance with the position environment of the slide door.

20. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 17, 18 or 19 above includes that the adjustment volume re-adjusting means judges that, when the slide door advances and a motor load tends to increase more than a normal value, there is a possibility of generating a pinch, and decreases the adjustment volume of the less speed or thins out the times of this adjustment, or doesn't re-adjust even if the less speed detection means detects the less speed.

21. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 17, 18, 19 or 20 above includes that, when an opposite adjustment with reference to the previous adjustment is carried out, the adjustment volume re-adjusting means decreases the adjustment volume and outputs the re-adjustment volume.

22. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 17, 18, 19, 20 or 21 above includes that, after the adjustment volume re-adjusting means reflects a detection result of the over speed or the less speed on the motor control operation, the adjustment volume re-adjusting means thins out a suitable number of times of the over speed adjustment or the less speed adjustment according to the position of the slide door and outputs such adjustment volume.

23. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 17, 18, 19, 20, 21 or 22 above includes that the motor control means uses a pulse width modulation control system.

24. A device for automatically controlling the open-close of a slide door for a vehicle is adapted to movably open and close the slide door by driving a motor, the slide door supported so as to be able to open and close along a guide track installed in a vehicle body, the device comprising:

a door drive means having a reversible motor,

a motor load detection means for detecting a correspondence data of a motor load of the door drive means,

a door position detection means for detecting a position of the slide door guided by the guide track within a range from a full-open to a full-close positions of the slide door,

a memory means for memorizing the correspondence data concerning the position of the slide door, with reference to the correspondence data detected by the motor load detection means, in a predetermined sampling region address-appointed by the detection

position of the door position detection means,

a correspondence data study means for suitably correcting the read-out correspondence data on the basis of the correspondence data lastly detected every time that the correspondence data memorized in the memory means is read out in the address of the last sampling region, and studying the corrected data as the correspondence data of the motor load to be newly memorized,

and a pinch judgement means for reading out the correspondence data memorized in the sampling region advanced at a suitable number of the regions along the movement direction from the other sampling region in which the slide door exists; calculating in necessary the read-out correspondence data and the correspondence data of the sampling region in which the slide door exists, in order to determine a forecast value of the correspondence data forecasted along the movement direction; and judging, on the basis of a deviation between the forecast value and the correspondence data of the sampling region in which the slide door exists, whether there is a pinch or not.

25. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 24 above includes that the correspondence data of the motor load is the motor current value detected intermittently.

26. The device for automatically controlling the open-close of the slide door for the vehicle according to the claim 24 above includes that the correspondence data of the motor load is an average current value of a plurality of these motor current intermittently detected in the sampling regions having address corresponding to the door position.

27. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 24, 25 or 26 above includes that the correspondence data memorized in the memory means is a change rate of the current value or the average current value of the just before detected sampling region concerning the current value or the average current value detected in the sampling regions respectively arranged along the movement direction, and the current value or the

average current value detected at this time.

28. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 24, 25, 26 or 27 above includes that the pinch judgement means changes a judgement degree according to the door position and its operation direction when the pinch judgement means judges, by means of the deviation between the forecast value determined on the basis of the memorized correspondence data and the correspondence data of the sampling region in which the slide door exists, whether there is a pinch or not.

29. The device for automatically controlling the open-close of the slide door for the vehicle according to these claims 24, 25, 26, 27 or 28 above includes that, when the pinch judgement means judges, by means of the deviation between the forecast value determined on the basis of the memorized correspondence data and the correspondence data of the sampling region in which the slide door exists, whether there is a pinch or not, the pinch judgement means judges an increase trend of the recent correspondence data.